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SERIES Q: SWITCHING AND SIGNALLING

Q3 interface

**ATM-PON requirements and managed entities
for the network view**

ITU-T Recommendation Q.834.2

(Formerly CCITT Recommendation)

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ATM-PON requirements and managed entities for the network view

Summary

This Recommendation defines the managed entities that are required to support the requirements for the management of ATM-PON (Passive Optical Network). These definitions are to be used to develop a protocol-neutral information model. A network view and a network element view combined with the network view of an ATM-PON are modelled according to a protocol-neutral information modelling concept. The concept provides a protocol-neutral MIB and thus permits developers to derive an implementation-specific MIB from any management protocol. The information model described herein is used on an interface between a Network Management Layer and an Element Management Layer.

Source

ITU-T Recommendation Q.834.2 was prepared by ITU-T Study Group 4 (2001-2004) and approved under the WTSA Resolution 1 procedure on 13 April 2001.

FOREWORD

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ITU-T Recommendation Q.834.2

ATM-PON requirements and managed entities for the network view

1 Scope

This Recommendation specifies an information model of ATM-PON system at a Q interface at a reference point beyond an element management layer [1]. This Q interface is defined as the network view and the network element view combined with the network view (combined view).

This Recommendation provides network view managed entities to support a protocol-neutral information model for ATM-PON. As a consequence, the managed entities and their properties will be used to develop a protocol-neutral information model. The model may then be used to develop specific MIBs which are appropriate for the management protocols. These managed entities are specific to the ATM-PON system. Therefore, the suffix "F" is added to their names in order to distinguish them from generic managed entities.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T G.983.1 (1998), *Broadband optical access systems based on Passive Optical Networks (PON)*.
- [2] ITU-T G.983.2 (2000), *ONT management and control interface specification for ATM PON*.
- [3] ITU-T M.3013 (2000), *Considerations for a telecommunications management network*.
- [4] ITU-T Q.834.1 (2001), *ATM-PON requirements and managed entities for the network element view*.
- [5] ITU-T G.852.2 (1999), *Enterprise viewpoint description of transport network resource model*.

3 Definitions

This Recommendation defines the following terms:

3.1 optical access network (OAN): The set of access links sharing the same network-side interfaces and supported by optical access transmission systems. The OAN may include a number of ODNs connected to the same OLT.

3.2 optical distribution network (ODN): An ODN provides the optical transmission means from the OLT towards the users, and vice versa. It utilizes passive optical components.

3.3 optical line terminal (OLT): An OLT provides the network-side interface of the OAN, and is connected to one or more ODNs.

3.4 optical network terminal (ONT): An ONU used for FTTH and includes the User Port function.

3.5 optical network unit (ONU): An ONU provides (directly or remotely) the user-side interface of the OAN, and is connected to the ODN.

4 Abbreviations

This Recommendation uses the following abbreviations:

AAL	ATM Adaptation Layer
ADSL	Asymmetrical Digital Subscriber Line
AN	Access Network
APON	ATM-PON
ATM	Asynchronous Transfer Mode
BICI	Broadband Inter-Carrier Interface
BISSI	Broadband Inter-Switching System Interface
CCITT	Consultative Committee for International Telephone and Telegraph
CES	Circuit Emulation Service
CMIP	Common Management Information Protocol
CORBA	Common Object Request Broker Architecture
CTP	Connection Termination Point
DCN	Data Communications Network
DSx	Digital Signal x
EM	Element Management
EML	Element Management Layer
EMS	Element Management System
ETSI	European Telecommunications Standards Institute
FSAN	Full Service Access Network
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ITU	International Telecommunication Union
LBLID	Loop Back Location Identifier
ME	Managed Entity
MIB	Management Information Base
NE	Network Element
NEL	Network Element Layer
NM	Network Management
NML	Network Management Layer
NMS	Network Management System
NT	Network Termination
OAM	Operations, Administration and Maintenance

OAN	Optical Access Network
ODN	Optical Distribution Network
OLT	Optical Line Terminal
OMG	Object Management Group
ONT	Optical Network Terminal
ONU	Optical Network Unit
OSF	Operations System Function
PDH	Plesiochronous Digital Hierarchy
PM	Performance Management
PON	Passive Optical Network
PVC	Permanent Virtual Circuit
QoS	Quality of Service
SCP	Service Capability and Performance
SDH	Synchronous Digital Hierarchy
SM	Service Management
SML	Service Management Layer
SN	Service Node
SNC	SubNetwork Connection
SNI	Service Node Interface
SNMP	Simple Network Management Protocol
TBD	To Be Determined
TMN	Telecommunication Management Network
TP	Termination Point
TTP	Trail Termination Point
UML	Unified Modelling Language
UNI	User-Network Interface
VC	Virtual Channel
VCC	Virtual Channel Connection
VCI	Virtual Channel Identifier
VCL	Virtual Channel Link
VDSL	Very high speed Digital Subscriber Line
VP	Virtual Path
VPC	Virtual Path Connection
VPI	Virtual Path Identifier
VPL	Virtual Path Link

5 General overview

5.1 Operations architecture

This Recommendation addresses the management functions of FSAN subnetworks across the Q interface.

The operation systems manage FSAN network elements and their interface ports by means of managing OLT through the Q interface. FSAN network elements include OLT, ODN, ONU, NT and ONT [1] shown as Figure 1. The ODN offers one or more optical paths between one OLT and one or more ONU/ONTs. ONU and NT are connected by ADSL or VDSL. OLT has a BICI/BISSI port towards the core network, and ONT/NT has one or more UNI port(s) for the customers. The FSAN subnetwork is defined between BICI/BISSI ports and UNI ports. The OLT manages ONU, NT and ONT [2].

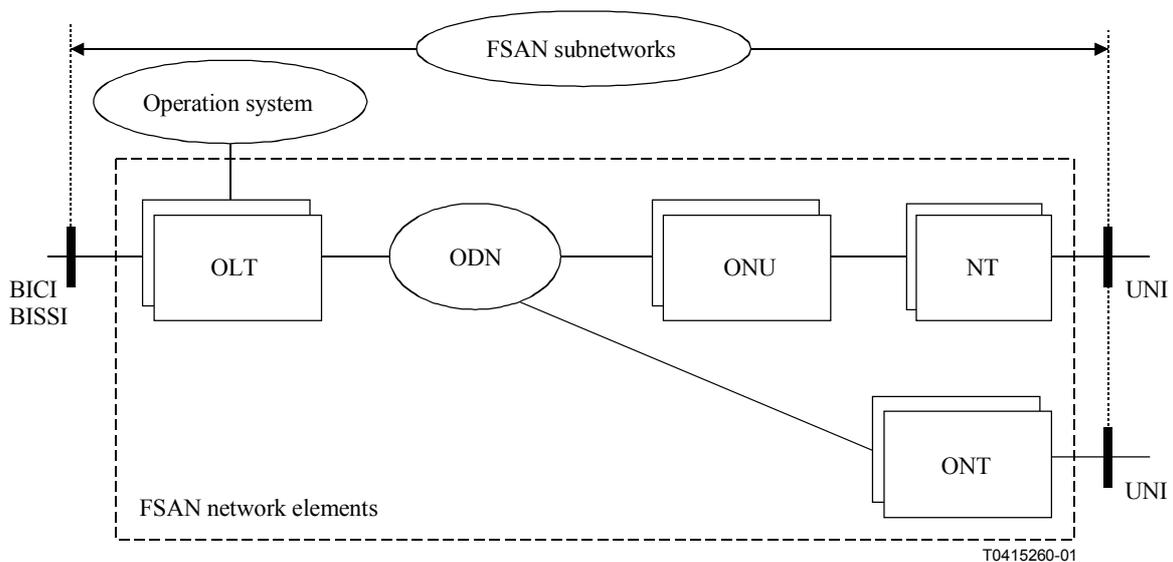


Figure 1/Q.834.2 – FSAN network elements and FSAN subnetworks

The FSAN Element Management System (FSAN EMS) consists of E-OSF and includes a little N-OSF and S-OSF [3]. It manages both FSAN network element and FSAN subnetwork shown in Figure 2. The Q interface specifies the network view and the combined view. This interface is called IF1 in the FSAN operations requirements in Appendix I/Q.834.1 [4].

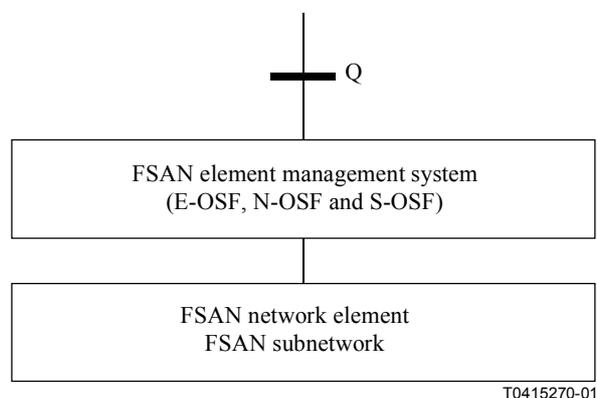


Figure 2/Q.834.2 – Target interface of operations architecture

5.2 Approach to information modelling

We have taken a black box approach on the two ends of the interface in order to make progress. The assumption of the approach is that as long as the model indicates the objects and attributes, albeit at a high level, it should be possible to arrive at a common specification of the Q interface.

5.3 NE view combined with NW view (Combined view)

This Recommendation adopts a combined view defined as the network element (NE) view combined with the network (NW) view in order to treat both FSAN network element and FSAN subnetwork. Some NE view managed entities, such as vpTTPF, vpCTPF, vcTTPF and vcCTPF, point to and are pointed from the corresponding NW view managed entities, such as vpNetworkTTPF, vpNetworkCTPF, vcNetworkTTPF and vcNetworkCTPF, using NEAssignmentPtr in the combined view.

6 Requirements

The general requirements for the ATM-PON operation system are described in Appendix I/Q.834.1 [4], *FSAN operations requirements*. This Recommendation uses some of them.

The number and letter written after the requirements refer to an associated item in Appendix I/Q.834.1.

The FSAN Element Management System shall be able to create the logical representations of the resources required to manage the network and services. All necessary network and service parameters shall be supplied in the appropriate request. (77 M)

It shall be possible to create the logical resources in the FSAN Element Management System without the need for equipment to be physically present in the network. (79 M)

The FSAN Element Management System shall automatically allocate the required resources if they are not identified in the provision request. (82 M)

If all spare and installed resources are in use, the FSAN Element Management System shall use the next available spare and not the installed resources. (83 M)

If there are no spare resources awaiting installation, then the FSAN Element Management System shall propose a list of the equipment that needs to be installed to allow the request to be fulfilled. The equipment list shall indicate:

- the type of equipment to be installed;
- the location where it is to be installed (rack/shelf/slot, OLT or ONU, etc.);
- the software and hardware versions which are compatible with the existing version of installed hardware. (84 M)

Each equipment list shall be stored in the FSAN Element Management System until an event is received from the NE to indicate that the network equipment has been physically installed and has been correctly authenticated. (85 M)

It shall be possible to pre-configure equipment prior to its installation by providing the required data when the logical representation is created. (86 M)

It shall be possible to modify service parameters (such as bit rate, service type, error checking as applicable) for individual UNI(s) or Virtual Paths (VPs) when the relevant resources are out of active use. (87 M)

The NMS shall be able to create logical resources and paths for end-to-end network and service provision. All necessary parameters shall be supplied in the appropriate request. (121 M)

It shall be possible to create the logical resources in the NMS without the need for the FSAN Element Management System to be present. (123 M)

The NMS shall receive an indication on the success or failure of all operations from FSAN Element Management System. (127 M)

7 Managed entities

This clause describes the managed entities that are visible across the Q interface. These managed entities are abstract representations of resources and services in a Full Service Access Network. Managed entities are defined in a protocol-neutral fashion. Further work will be required to make the MIB definitions protocol specific (e.g. CMIP- or CORBA-compliant). New specific classes are so indicated.

This Recommendation uses a combined view defined in 5.3. Some managed entities for the network view and those for the network element view are pointed to each other in the combined view. Managed entities for the network view point to and are pointed from those for network element view using NEAssignmentPtr.

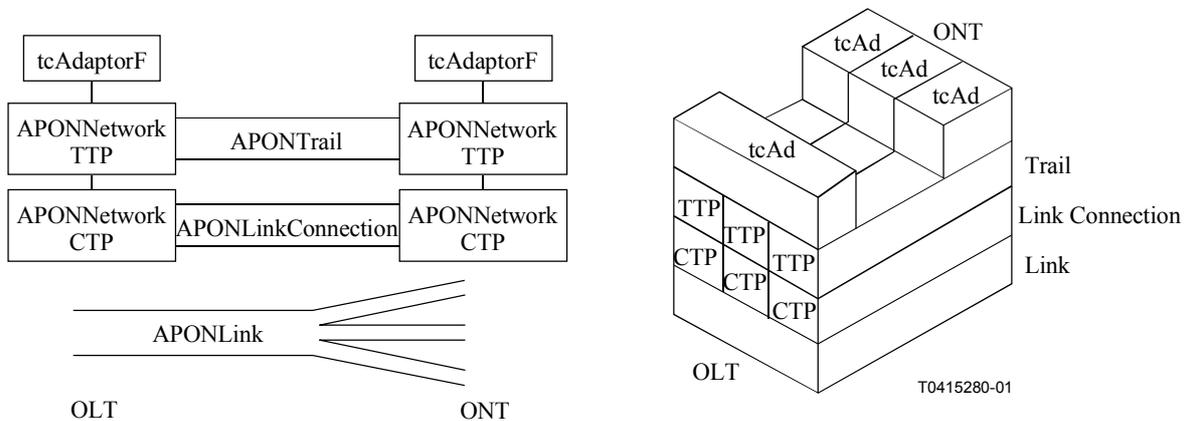


Figure 3/Q.834.2 – APON managed entities

The managed entity "tcAdaptorF" is defined in ITU-T Q.834.1 [4].

7.1 accessGroupF

This managed element is used to group networkTTPFs that lie outside the management scope of the FSAN EMS (even outside the scope of the operator's network) but need to be referred to for management purposes. For example, this managed entity will be used to group vcNetworkTTPFs instances terminated on customer-provided equipment. It is used to provide a topological view to the operator.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

TopologicalLinkFPtr: This attribute identifies the topologicalLinkF managed entity for which this managed entity is ending.

SignalIdentification: This attribute identifies the characteristic signal transported between this accessGroupF and the other end of the topologicalLinkF.

Logical(MTP)LinkFPtr: This attribute identifies the logicalLinkF or logicalMTPLinkF associated with this end point.

NetworkTTPFPtrList: This attribute serves as a pointer to the instances of the networkTTPF that is grouped by this managed entity. This pointer may be null.

TopologicalDirectionality: This attribute identifies whether the termination point is "source", "sink", or "bidirectional".

Relationships

Zero or one of these managed entities is associated with a topologicalLinkF.

7.2 adslLayerNetworkDomainF

This managed entity is a type of LayerNetworkDomainF and inherits all the attributes and relationships defined by LayerNetworkDomainF. The characteristic signal associated with this layer is defined by ITU-T G.992.1, ITU-T G.992.2, or ANSI T1.413.

7.3 adslLinkConnectionF

This managed entity is a type of LinkConnectionF and inherits all the attributes and relationships defined by LinkConnectionF. This managed entity represents a VDSL link connection, derived from the ITU-T G.852.2 [5] definition, i.e. "the transparent capacity of transfer of information characterized by a given signal identification between two fixed points". Directionality is always set to "bidirectional".

Attributes

SignalIdentification: This fixed attribute describes the signal that is transferred across the link. Here, it is set to "ADSL".

Relationships

A topological link is a group of link connections sharing the same extremities. This relationship involves zero or more instances of the managed entity adslLinkConnectionF. An adslLinkConnectionF links two adslNetworkCTPFs.

7.4 adslNetworkCTPF

This managed entity is a type of networkCTPF and inherits all the attributes and relationships defined by networkCTPF. This managed entity is used to represent the termination of adslTrailF.

Attributes

NEAssignmentPtr: This attribute serves as a pointer to the instance of the adslCTPF managed entity to which it is related.

Relationships

One or more of these managed entities exist for each PhysicalPathTPF of type "ADSL". There is one of these managed entities for each adslNetworkTTPF. There is one or more of these managed entities contained within an ONU or NT.

7.5 adslNetworkTTPF

This managed entity is a type of networkTTPF and inherits all the attributes and relationships defined by networkTTPF. This managed entity represents the point in the FSAN NE where adslTrailF is terminated and originated. The following alarms can be detected at this managed entity: LOF (Loss of Frame), RFI (Remote Failure Indication), SD (Signal Degraded) fast datastream, SD (Signal Degraded) interleave datastream, SD (Signal Degraded) fast datastream far end, SD (Signal Degraded) interleave datastream far end, Initialization failed (detected by dataInitFailure, configInitFailure, protocolInitFailure, noPeerAtuPresent), Loss of Link, and Loss of Power.

Attributes

AlarmSeverityAssignmentProfilePtr: This attribute provides a pointer relationship to an alarm severity assignment profile managed entity.

AlarmStatus: This attribute provides information to the managing system on the alarm condition of the managed entity. Valid values include "under repair", "critical", "major", "minor", "alarm outstanding", and "null". Interpretation of these values is found in ITU-T X.731.

NEAssignmentPtr: This attribute serves as a pointer to the instance of the adslTTPF managed entity to which it is related.

Relationships

There is one or more of these managed entities contained within an ONU or NT. One of these managed entities exists for each adslNetworkCTP.

7.6 adslSubnetworkF

This managed entity is a type of subnetworkF and inherits all the attributes and relationships defined by subnetworkF. Signal identification is set to "ADSL".

Attributes

ONUPtr: This attribute identifies the associated ONU.

ContainedLinkList: This attribute identifies the instances of adslTopologicalLinkF contained in this subnetwork.

7.7 adslTopologicalLinkEndF

This managed entity is a type of topologicalLinkEndF and inherits all the attributes and relationships defined by topologicalLinkEndF. Signal identification is set to "ADSL".

7.8 adslTopologicalLinkF

This managed entity is a type of topologicalLinkF and inherits all the attributes and relationships defined by topologicalLinkF. Signal identification is set to "ADSL".

7.9 adslTrailF

This managed entity is a type of trailF and inherits all the attributes and relationships defined by trailF.

Relationships

Each adslTrailF is terminated by adslNetworkTTPs.

7.10 APONLayerNetworkDomain

This managed entity is a type of LayerNetworkDomainF and inherits all the attributes and relationships defined by LayerNetworkDomainF. Characteristic information provided in this layer is defined by the APON protocol as defined in ITU-T G.983.1 [1].

7.11 APONLink

This managed entity is a type of LogicalMTPLinkF and inherits all the attributes and relationships defined by LogicalMTPLinkF. Each PON is composed of two LogicalMTPLinkF(s), one describing the downstream and the other describing the upstream capacity provided by the OLT PON interface.

The Aend is associated with a PON interface on the OLT. There is one Zend for each ONT ranged to the Aend PON interface. The TotalLinkConnectionCount attribute value is determined by the number of output ports on the passive optical coupler.

Attributes

OLTTCAdaptorId: This attribute identifies the OLT PON interface.

ONTTCAdaptorIdList: This attribute identifies (lists) the subtending ONT PON interfaces.

PairedAPONLinkPtr: This pointer attribute identifies the APON Link that paired with this one describes the upstream and downstream APON layer capacity.

Relationships

There are two APONLink managed entities for every PON interface on the OLT.

7.12 APONLinkConnection

This managed entity is a type of LinkConnectionF and inherits all the attributes and relationships defined by LinkConnectionF.

Relationships

There is one instance of this managed entity for every installed ONT.

7.13 APONLogicalLinkEnd

This managed entity is a type of logicalLinkEndF and inherits all the attributes and relationships defined by logicalLinkEndF.

7.14 APONNetworkCTP

This managed entity is a type of networkCTPF and inherits all the attributes and relationships defined by networkCTPF. This managed element is used to represent the termination of APONLinkConnection on an FSAN NE.

Attributes

NEAssignmentPtr: This attribute serves as a pointer to the instance of the APONCTP managed entity to which it is related.

Relationships

One or more of these managed entities exist for each PhysicalPathTPF of type "APON". There is one of these managed entities for each APONNetworkTTP. There is one or more of these managed entities contained within an OLT, ONU, or ONT.

7.15 APONNetworkTTP

This managed entity is a type of networkTTPF and inherits all the attributes and relationships defined by networkTTPF. This managed entity represents the point in the FSAN NE where APONTrailF is terminated and originated. The following alarms can be detected at this managed entity: Loss of Physical Layer [detected by LOAi (Loss of Acknowledgement), OAMLi (PLOAM cell loss), CPEi (Cell Phase Error), SUFi (Start-up failure) and REC-INH (Receive Alarm Inhibition)], Sdi (Signal Degraded) and SD (Signal Degraded far end).

Attributes

AlarmSeverityAssignmentProfilePtr: This attribute provides a pointer relationship to an alarm severity assignment profile managed entity.

AlarmStatus: This attribute provides information to the managing system on the alarm condition of the managed entity. Valid values include "under repair", "critical", "major", "minor", "alarm outstanding", and "null". Interpretation of these values is found in ITU-T X.731.

NEAssignmentPtr: This attribute serves as a pointer to the instance of the APONTTP managed entity to which it is related.

Relationships

There is one or more of these managed entities contained within an OLT, ONU, or ONT. One of these managed entities exists for each APONNetworkCTP.

7.16 APONSubnetwork

This managed entity is a type of subnetworkF and inherits all the attributes and relationships defined by subnetworkF. Signal identification is set to "APON".

Attributes

OLTPtr: This attribute identifies the associated OLT. This pointer may be null-valued when the APONSubnetworkF is the subnetworkF for the entire APONNetworkLayerDomainF.

ContainedLinkList: This attribute identifies the instances of logicalMTPLinkF contained in this subnetworkF.

ContainedLinkEndList: This attribute identifies the instances of logicalLinkEndF contained in this subnetworkF.

Relationships

One of these managed entities exists for each installed OLT.

7.17 APONTrail

This managed entity is a type of trailF and inherits all the attributes and relationships defined by trailF.

Relationships

Each APONTrail is terminated by two APONNetworkTTPs.

7.18 BridgedLANLayerNetworkDomainF

This managed entity is a type of LayerNetworkDomainF and inherits all the attributes and relationships defined by LayerNetworkDomainF. Characteristic information provided in this layer is set to "Bridged LAN".

7.19 BridgedLANNetworkCTPF

This managed entity is a type of NetworkCTPF and inherits all the attributes and relationships defined by NetworkCTPF. The attribute PointDirectionality has the value "bidirectional". It terminates and originates a link connection at a bridge port on the Learning Bridge located on the ONT.

Attributes

NEAssignmentPtr: This attribute identifies the EthernetCTPF in the NE view associated with this managed entity.

Relationships

There is zero or more of these managed entities contained within LAN subscriber card on an FSAN ONT. One of these managed entities exists for each BridgedLANNetworkTTPF.

7.20 BridgedLANNetworkTTPF

This managed entity is a type of NetworkTTPF and inherits all the attributes and relationships defined by NetworkCTPF. The attribute PointDirectionality has the value "bidirectional".

Attributes

NEAssignmentPtr: This attribute identifies the EthernetTTPF in the NE view associated with this managed entity.

Relationships

There is zero or more of these managed entities contained within the LAN subscriber card on an FSAN ONT. One of these managed entities exists for each BridgedLANNetworkCTPF.

7.21 BridgedLANSubnetworkF

This managed entity is a type of SubnetworkF and inherits all the attributes and relationships defined by SubnetworkF. This managed entity cannot be further decomposed. Characteristic information provided in this layer is set to "Bridged LAN".

7.22 DS1LayerNetworkDomainF

This managed entity is a type of LayerNetworkDomainF and inherits all the attributes and relationships defined by LayerNetworkDomainF. Characteristic information provided in this layer is set to "DS-1".

7.23 DS1NetworkCTPF

This managed entity is a type of networkCTPF and inherits all the attributes and relationships defined by networkCTPF. Characteristic information provided in this layer is set to "DS-1".

Attributes

sncPtr: This attribute identifies the ds1SubnetworkConnectionF terminated by this networkCTPF.

NEAssignmentPtr: This attribute identifies the DS1CTPF associated with this networkCTPF.

Relationships

There is zero or more of these managed entities contained within a TDM interface on an FSAN NE. One of these managed entities exists for each DS1NetworkTTPF.

7.24 DS1NetworkTTPF

This managed entity is a type of networkTTPF and inherits all the attributes and relationships defined by networkTTPF. Characteristic information provided in this layer is set to "DS-1".

Attributes

NEAssignmentPtr: This attribute identifies the DS1TTPF associated with this networkTTPF.

Relationships

There is zero or more of these managed entities contained within a TDM interface on an FSAN NE. One of these managed entities exists for each DS1NetworkCTPF.

7.25 DS1SubnetworkConnectionF

This managed entity is a type of subnetworkConnectionF and inherits all the attributes and relationships defined by subnetworkConnectionF.

7.26 DS1SubnetworkF

This managed entity is a type of subnetworkF and inherits all the attributes and relationships defined by subnetworkF. Signal identification is set to "DS-1".

Attributes

OLTPtr: This attribute identifies the associated OLT.

7.27 DS3LayerNetworkDomainF

This managed entity is a type of LayerNetworkDomainF and inherits all the attributes and relationships defined by LayerNetworkDomainF. Characteristic information provided in this layer is set to "DS-3".

7.28 DS3NetworkCTPF

This managed entity is a type of networkCTPF and inherits all the attributes and relationships defined by networkCTPF. Characteristic information provided in this layer is set to "DS-3".

Attributes

sncPtr: This attribute identifies the ds3SubnetworkConnectionF terminated by this networkCTPF.

NEAssignmentPtr: This attribute identifies the DS3CTPF associated with this networkCTPF.

Relationships

There is zero or more of these managed entities contained within a TDM interface on an FSAN NE. One of these managed entities exists for each DS3NetworkTTPF.

7.29 DS3NetworkTTPF

This managed entity is a type of networkTTPF and inherits all the attributes and relationships defined by networkTTPF. Characteristic information provided in this layer is set to "DS-3".

Attributes

NEAssignmentPtr: This attribute identifies the DS3TTPF associated with this networkTTPF.

Relationships

There is zero or more of these managed entities contained within a TDM interface on an FSAN NE. One of these managed entities exists for each DS3NetworkCTPF.

7.30 DS3SubnetworkF

This managed entity is a type of subnetworkF and inherits all the attributes and relationships defined by subnetworkF. Signal identification is set to "DS-3".

Attributes

OLTPtr: This attribute identifies the associated OLT.

7.31 DS3SubnetworkConnectionF

This managed entity is a type of subnetworkConnectionF and inherits all the attributes and relationships defined by subnetworkConnectionF.

7.32 E1LayerNetworkDomainF

This managed entity is a type of LayerNetworkDomainF and inherits all the attributes and relationships defined by LayerNetworkDomainF. Characteristic information provided in this layer is set to "E1".

7.33 E1NetworkCTPF

This managed entity is a type of networkCTPF and inherits all the attributes and relationships defined by networkCTPF. Characteristic information provided in this layer is set to "E1".

Attributes

sncPtr: This attribute identifies the E1SubnetworkConnectionF terminated by this networkCTPF.

NEAssignmentPtr: This attribute identifies the E1CTPF associated with this networkCTPF.

Relationships

There is zero or more of these managed entities contained within a TDM interface on an FSAN NE. One of these managed entities exists for each E1NetworkTTPF.

7.34 E1NetworkTTPF

This managed entity is a type of networkTTPF and inherits all the attributes and relationships defined by networkTTPF. Characteristic information provided in this layer is set to "E1".

Attributes

NEAssignmentPtr: This attribute identifies the E1TTPF associated with this networkTTPF.

Relationships

There is zero or more of these managed entities contained within a TDM interface on an FSAN NE. One of these managed entities exists for each E1NetworkCTPF.

7.35 E1SubnetworkConnectionF

This managed entity is a type of subnetworkConnectionF and inherits all the attributes and relationships defined by subnetworkConnectionF.

7.36 E1SubnetworkF

This managed entity is a type of subnetworkF and inherits all the attributes and relationships defined by subnetworkF. Signal identification is set to "E1".

Attributes

OLTPtr: This attribute identifies the associated OLT.

7.37 E3LayerNetworkDomainF

This managed entity is a type of LayerNetworkDomainF and inherits all the attributes and relationships defined by LayerNetworkDomainF. Characteristic information provided in this layer is set to "E3".

7.38 E3NetworkCTPF

This managed entity is a type of networkCTPF and inherits all the attributes and relationships defined by networkCTPF. Characteristic information provided in this layer is set to "E3".

Attributes

sncPtr: This attribute identifies the E3SubnetworkConnectionF terminated by this networkCTPF.

NEAssignmentPtr: This attribute identifies the E3CTPF associated with this networkCTPF.

Relationships

There is zero or more of these managed entities contained within a TDM interface on an FSAN NE. One of these managed entities exists for each E3NetworkTTPF.

7.39 E3NetworkTTPF

This managed entity is a type of networkTTPF and inherits all the attributes and relationships defined by networkTTPF. Characteristic information provided in this layer is set to "E3".

Attributes

NEAssignmentPtr: This attribute identifies the E3TTPF associated with this networkTTPF.

Relationships

There is zero or more of these managed entities contained within a TDM interface on an FSAN NE. One of these managed entities exists for each E3NetworkCTPF.

7.40 E3SubnetworkConnectionF

This managed entity is a type of subnetworkConnectionF and inherits all the attributes and relationships defined by subnetworkConnectionF.

7.41 E3SubnetworkF

This managed entity is a type of subnetworkF and inherits all the attributes and relationships defined by subnetworkF. Signal identification is set to "E3".

Attributes

OLTPtr: This attribute identifies the associated OLT.

7.42 layerNetworkDomainF

The layer network domain is defined to support the requirement for independent layer management. Each layer is concerned with the generation and transfer of characteristic information. The layer network domain managed entity represents the part of the layer that is available to an operator managing system. It contains only managed entities from a single layer. The layer domain includes all topological aspects of the transport network layer. It is assumed that a layerNetworkDomainF contains one and only one subnetworkF, which can be further decomposed. There may be several layer network domains within a single network. It is assumed that the layer network domain is created automatically at the installation of the superior networkF managed entity. The automatic creation of instances of this managed entity shall be reported to the operator managing system. The managing system may subsequently create and delete other instances of the layer network domain provided there are no dependent entities.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

SignalIdentification: This attribute represents the characteristic information of the layer network domain.

SystemTitle: This attribute provides an operator-provided system name to identify the network.

UserLabel: This attribute allows a manager to represent additional information about the layer network domain.

Relationships

A layerNetworkDomainF is delineated by zero or more networkCTPF(s). A layerNetworkDomainF groups zero or more trailF(s). A layerNetworkDomainF is partitioned into one or more subnetworkF(s).

7.43 linkConnectionF

This managed entity is used to describe the transport entity transferring information between two networkCTPFs. A link connection can be a component of a trail. A sequence of one or more link connections and subnetwork connections may be pieced together to form a trail. A linkConnectionF cannot be created between a composite subnetwork and one of its component subnetworks. An instance of this managed entity is created automatically with the provisioning of information transfer in the network layer to which this link connection belongs. The managed entity can only be deleted when the provisioned bandwidth is taken out of service. The managed entity supports availability status and administrative state functions as defined in ITU-T X.731. Changes in state are reported automatically or on demand to the managing system.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

AdministrativeState: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by instances of this managed entity.

AvailabilityStatus: This attribute indicates whether or not a managed entity is capable of performing its task.

UserLabel: This attribute provides the listing of service Ids associated with this connection.

ANetworkCTPPtr: This attribute is used to identify one end of the link connection.

ZNetworkCTPPtr: This attribute is used to identify the other end of the link connection.

Directionality: This attribute indicates whether or not a link is "unidirectional", "bidirectional", or "undefined".

RecoverableInd: This attribute is used to identify the connection as recoverable (protected) or not.

Relationships

This managed entity is established between networkCTPF.

7.44 logicalLinkEndF

A logical link end contains networkCTPFs for the purposes of representing topology. It represents the end of a logicalLinkF or logicalMTPLinkF.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

Logical(MTP)LinkFPtr: This attribute identifies the logicalLinkF or logicalMTPLinkF associated with this end point.

Directionality: This attribute indicates whether or not a link is "upstream", "downstream", or "bidirectional".

MaximumBandwidth: This attribute identifies the maximum amount of bandwidth assigned to the link end.

ProvisionedBandwidth: This attribute identifies the amount of bandwidth currently provisioned to the link end.

ProvisionedNetworkCTPCount: This attribute identifies the count of networkCTPFs assigned to the link end.

TotalNetworkCTPCount: This attribute identifies the count of networkCTPFs allowed at the link end.

UserLabel: This string may be used to describe additional information about the managed entity, such as a circuit identifier.

Relationships

Each logicalLinkF or logicalMTPLinkF has two or more logicalLinkEndF(s).

7.45 logicalLinkF

A logical link is administratively composed of link connections or bandwidth that may be provided by one or more topological links or other logical links. This entity may be explicitly created by the network management system.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

SignalIdentification: This attribute identifies the characteristic information transported by the topological link.

Directionality: This attribute indicates whether or not a link is "unidirectional", "bidirectional", or "undefined".

Aend: This pointer attribute identifies the link end at one extremity.

Zend: This pointer attribute identifies the link end or access group at the other extremity.

ProvisionedBandwidth: This attribute identifies the maximum amount of bandwidth configured for the link.

AvailableBandwidth: This attribute identifies the amount of bandwidth left on the link.

ProvisionedLinkConnectionCount: This attribute identifies the count of link connections configured for the link.

TotalLinkConnectionCount: This attribute identifies the count of link connections allowed on the link.

Relationships

A logicalLinkF is a group of link connections sharing two extremities. One logicalLinkF has a relationship with the two managed entities that it is linking. A logicalLinkF cannot exist without the subnetworkF being identified.

7.46 logicalMTPLinkF

A logicalMTPLinkF is administratively composed of link connections or bandwidth that may be provided by one or more topological links or other logical links where the links share a common Aend link end point. This entity may be explicitly created by the network management system.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

SignalIdentification: This attribute identifies the characteristic information transported by the topological link.

Directionality: This attribute indicates whether or not a logicalMTPLink is "downstream" (from Aend), "upstream" (to Aend), or "bidirectional".

Aend: This pointer attribute identifies the shared link end.

ZendList: This pointer attribute identifies the list of terminating link ends or access groups.

ProvisionedBandwidth: This attribute identifies the maximum amount of bandwidth configured for the link.

AvailableBandwidth: This attribute identifies the amount of bandwidth left on the link.

ProvisionedLinkConnectionCount: This attribute identifies the count of link connections configured for the link.

TotalLinkConnectionCount: This attribute identifies the count of link connections allowed on the link.

Relationships

A logicalMTPLinkF is a group of link connections sharing one extremity. One logicalMTPLinkF has a relationship with the managed entities that it is linking. A logicalMTPLinkF cannot exist without the subnetworkF being identified.

7.47 networkF

The networkF managed entity groups all the managed entities visible over the NMS-EMS interface. The managed entities grouped under networkF may span several transport layers (e.g., the VP and VC layers). This managed entity is automatically created when the FSAN network is initialized. It is not created or deleted by the managing system.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

SystemTitle: This attribute provides an operator-provided system name to identify the network.

Relationships

The networkF managed entity is made up of a set of transport and other managed entities (e.g., logF). This managed entity is a type of layerNetworkDomainF and inherits all the attributes and relationships defined by layerNetworkDomainF.

7.48 networkCTPF

This managed element is used to represent the termination of linkConnectionFs on an FSAN NE and can also represent the termination of subnetworkConnectionFs on an FSAN NE. Instances of this managed entity are created and deleted by request of the managing system or implicitly through a provisioning request. The managed entity supports availability status and administrative state functions as defined in ITU-T X.731. Changes in state are reported automatically or on demand to the managing system.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

AdministrativeState: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by instances of this managed entity.

AvailabilityStatus: This attribute indicates whether or not a managed entity is capable of performing its task.

SupportedByPlug-inF: This attribute identifies the interface circuit pack to which this managed entity is associated.

NetworkTPPtr: This attribute serves as a pointer to the instance of the networkTTPF that is supported by this managed entity. This pointer may be null.

ConnectivityPtr: This attribute serves as a pointer to the instance of linkConnectionF that is terminated by this managed entity.

PointDirectionality: This attribute identifies whether the termination point is "source", "sink", or "bidirectional".

Relationships

Two instances of this managed entity are associated to each link connection. Zero or more of these instances are associated with each subnetworkConnectionF.

7.49 networkTTPF

This managed element is used to represent the termination of trailFs on an FSAN NE and can be used to represent the termination of subnetworkConnectionFs on an FSAN NE. Instances of this managed entity are created and deleted by request of the managing system or implicitly through a provisioning request. The managed entity supports availability status and administrative state functions as defined in ITU-T X.731. Changes in state are reported automatically or on demand to the managing system.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

AdministrativeState: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by instances of this managed entity.

AvailabilityStatus: This attribute indicates whether or not a managed entity is capable of performing its task.

SupportedByPlug-inF: This attribute identifies the interface circuit pack to which this managed entity is associated.

NetworkTPPtr: This attribute serves as a pointer to the instance of the networkCTPF that supports this managed entity.

ConnectivityPtr: This attribute serves as a pointer to the instance of trailF that is terminated by this managed entity.

PointDirectionality: This attribute identifies whether the termination point is "source", "sink", or "bidirectional".

Relationships

Zero or more of these instances are associated with each subnetworkConnectionF. Two of these instances are associated with each trailF.

7.50 subnetworkConnectionF

This managed entity represents an ITU-T G.852.2 [5] subnetwork connection (SNC), i.e. "a transport entity that transfers information across a subnetwork". A subnetwork connection is associated with

two network termination points or a network termination point and a group of network termination points. The managed entity supports availability status and administrative state functions as defined in ITU-T X.731. Changes in state are reported automatically or on demand to the managing system.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

AdministrativeState: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by instances of this managed entity.

AvailabilityStatus: This attribute indicates whether or not a managed entity is capable of performing its task.

UserLabel: This attribute provides the listing of service Ids associated with this connection.

ANetworkTTPtr: This attribute is used to identify one end of the subnetwork connection.

ZNetworkTTPtr: This attribute is used to identify the other end of the subnetwork connection.

Directionality: This attribute indicates whether or not a link is "unidirectional", "bidirectional", or "undefined".

RecoverableInd: This attribute is used to identify the connection as recoverable (protected) or not.

Relationships

A subnetwork connection is associated with network termination points or a network termination point and a group of network termination points. The network termination points may be networkTTPFs or networkCTPFs.

7.51 subnetworkF

A subnetworkF (according to ITU-T G.852.2 [5]) is a topological component used for carrying characteristic information. Note that a subnetworkF may be empty. Subnetworks are used for making subnetwork connections. This Managed Entity is specialized per layer. The subnetworkF is delineated by networkCTPF managed entities. Instances of this managed entity are created and deleted by request of the managing system. The managed entity supports administrative state and availability status functions as defined in ITU-T X.731. Changes in state and status are reported automatically or on demand to the managing system.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

AdministrativeState: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by instances of this managed entity.

AvailabilityStatus: This attribute describes the degree to which the managed entity is able to perform its normal functions.

SupportedByTPList: This attribute identifies the vcNetworkCTPFs delineating the managed entity.

SignalIdentification: This attribute represents the specific format that the resource carries.

UserLabel: This attribute provides an operator-defined label.

Relationships

One or more of these managed entities exist for each installed or pre-provisioned FSAN NE.

7.52 topologicalLinkEndF

A topological link end contains networkCTPFs for the purposes of representing topology. It represents the end of a topological link. It is related to one and only one networkTTPF in the underlying server layer.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

ServerNetworkTTPFPtr: This attribute identifies the networkTTPF managed entity in the server layer supporting this end point.

TopologicalLinkFPtr: This attribute identifies the topological link associated with this end point.

Directionality: This attribute indicates whether or not a link is "unidirectional", "bidirectional", or "undefined".

MaximumBandwidth: This attribute identifies the maximum amount of bandwidth assigned to the link end.

ProvisionedBandwidth: This attribute identifies the amount of bandwidth currently provisioned to the link end.

ProvisionedNetworkCTPCount: This attribute identifies the count of networkCTPFs assigned to the link end.

TotalNetworkCTPCount: This attribute identifies the count of networkCTPFs allowed at the link end.

UserLabel: This string may be used to describe additional information about the managed entity, such as a circuit identifier.

Relationships

Each topologicalLinkF has two topologicalLinkEndF(s).

7.53 topologicalLinkF

A topological link provides a topological description of capacity between two adjacent subnetworks (from one topological link end to another), or between a subnetwork and an access group. There can be multiple topological links between subnetworks. A topological link cannot be created between a composite subnetwork and one of its component subnetworks. This entity may be explicitly created by the network management system.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

SignalIdentification: This attribute identifies the characteristic information transported by the topological link.

ServerTrail: This attribute identifies the underlying trail in the layered network model for which this managed entity is its client unique.

Directionality: This attribute indicates whether or not a link is "unidirectional", "bidirectional", or "undefined".

Aend: This pointer attribute identifies the subnetwork, link end, or access group at one end of the topological link.

Zend: This pointer attribute identifies the subnetwork, link end, or access group at one end of the topological link.

ProvisionedBandwidth: This attribute identifies the maximum amount of bandwidth configured for the link.

AvailableBandwidth: This attribute identifies the amount of bandwidth left on the link.

ProvisionedLinkConnectionCount: This attribute identifies the count of link connections configured for the link.

TotalLinkConnectionCount: This attribute identifies the count of link connections allowed on the link.

Weight: This attribute describes the relative weight of using the link. The specific value of this attribute is determined by the managing system. This attribute takes on a NULL value in cases where the link is not assigned a specific weight.

Relationships

A `topologicalLinkF` is a group of link connections sharing the same extremities. This relationship involves one and only one instance of the `topologicalLinkF` managed entity, and zero or more instances of the `linkConnectionF` managed entity. One `topologicalLinkF` has a relationship with the two managed entities that it is linking. A `topologicalLinkF` cannot exist without the `subnetworkF` being identified.

7.54 trailF

This managed entity is used to describe the transport entity transferring information between two `networkTTPFs`. A sequence of one or more link connections and subnetwork connections may be pieced together to form a trail. An instance of this managed entity is created automatically with the provisioning of information transfer in the network layer to which this trail belongs. The managed entity can only be deleted when the provisioned service is taken out of service. The managed entity supports availability status and administrative state functions as defined in ITU-T X.731. Changes in state are reported automatically or on demand to the managing system.

Attributes

ManagedEntityId: This attribute provides a unique name for the managed entity instance.

AdministrativeState: This attribute is used to activate (unlock) and deactivate (lock) the functions performed by instances of this managed entity.

AvailabilityStatus: This attribute indicates whether or not a managed entity is capable of performing its task.

UserLabel: This attribute provides the listing of service Ids associated with this connection.

ANetworkTTPPtr: This attribute is used to identify one end of the link connection.

ZNetworkTTPPtr: This attribute is used to identify the other end of the link connection.

Directionality: This attribute indicates whether or not a link is "unidirectional", "bidirectional", or "undefined".

Relationships

There is one instance of this managed entity for the two `networkTTPFs` it joins.

7.55 vcLayerNetworkDomainF

This managed entity is a type of `layerNetworkDomainF` and inherits all the attributes and relationships defined by `layerNetworkDomainF`. Characteristic information provided in this layer is set to "VC".

7.56 vcLinkConnectionF

This managed entity is a type of linkConnectionF and inherits all the attributes and relationships defined by linkConnectionF. This managed entity represents a vc layer link connection, derived from the ITU-T G.852.2 [5] definition, i.e., "the transparent capacity of transfer of information characterized by a given signal identification between two fixed points." Directionality is always set to "bidirectional".

Attributes

SignalIdentification: This fixed attribute describes the signal that is transferred across the link. Here, it is set to "VC".

RetainedResource: This Boolean attribute indicates if the managed entity instance needs to be retained when it is a component of a composite connection (involving a set of link connections and subnetwork connections) that has been deleted or when supporting a trail that has been deleted.

CompositePtr: This pointer attribute identifies the vcSubnetworkConnectionF managed entity to which this managed entity belongs. It may be the null pointer.

Relationships

A topological link is a group of link connections sharing the same extremities. This relationship involves zero or more instances of the vcLinkConnectionF managed entity. A vcLinkConnectionF link is established between two vcNetworkCTPFs.

7.57 vcLogicalLinkF

This managed entity is a type of logicalLinkF and inherits all the attributes and relationships defined by logicalLinkF. Signal identification is set to "VC".

Attributes

LinkConnectionPtrList: This attribute identifies the vcLinkConnectionF instances grouped by this vcLogicalLinkF.

7.58 vcNetworkCTPF

This managed entity is a type of networkCTPF and inherits all the attributes and relationships defined by networkCTPF. This managed element is used to represent the termination of vcLinkConnectionF on an FSAN NE and (possibly) vcSubnetworkConnectionFs. A Traffic descriptor profile is used to characterize this managed entity.

Attributes

VPIVCIValue: This attribute identifies the VPI/VCI value associated with the link connection if the vcNetworkCTPF terminates a link connection.

SegmentEndPoint: This Boolean attribute indicates whether or not the vcNetworkCTPF managed entity instance has been configured to represent a VCC Segment End Point.

PMOAMMethod: This attribute indicates the method used to set up and terminate the PM OAM monitoring activity. Valid values are "TMN", "OAM", or "notSupported". If the value is "notSupported", then PM OAM is not supported on the end point.

PMOAMDirection: This attribute indicates the desired direction(s) of transmission to monitor PM OAM. Valid directions are: away from activator (transmit), towards activator (receive), or both.

PMOAMBlockSize: This attribute indicates the PM OAM nominal block size choice for both the receive and transmit directions.

PMOAMForwardActive: This Boolean attribute is used to initiate generation of PM OAM cells in the forward direction by setting the value to TRUE.

PMOAMBackwardActive: This Boolean attribute is used to initiate generation of PM OAM cells in the backward direction by setting the value to TRUE.

NEAssignmentPtr: This attribute serves as a pointer to the instance of the vcCTPF managed entity to which it is related.

Relationships

Zero or one instance of the vcNetworkCTPF managed entity may exist for each instance of a vcNetworkTTPF managed entity. Each instance of this managed entity may be associated with zero or one instance of the vcCTPF entity by the NE assignment Pointer attribute. Two of these management entities are associated with every vcLinkConnectionF. Zero or more of these managed entities may be associated with a vcSubnetworkConnectionF.

7.59 vcNetworkTTPF

This managed entity is a type of networkTTPF and inherits all the attributes and relationships defined by networkTTPF. This managed entity represents the point in the ATM subnetwork where the vcTrailF and associated overhead (F5 OAM cells) are terminated/originated.

Attributes

PMOAMMethod: This attribute indicates the method used to set up and terminate the PM OAM monitoring activity. Valid values are "TMN", "OAM", or "notSupported". If the value is "notSupported", then PM OAM is not supported on the end point.

PMOAMDirection: This attribute indicates the desired direction(s) of transmission to monitor PM OAM. Valid directions are: away from activator (transmit), towards activator (receive), or both.

PMOAMBlockSize: This attribute indicates the PM OAM nominal block size choice for both the receive and transmit directions.

PMOAMForwardActive: This Boolean attribute is used to initiate generation of PM OAM cells in the forward direction by setting the value to TRUE.

PMOAMBackwardActive: This Boolean attribute is used to initiate generation of PM OAM cells in the backward direction by setting the value to TRUE.

NEAssignmentPtr: This attribute serves as a pointer to the instance of the vcTTPF managed entity to which it is related.

Relationships

Zero or one instance of the vcNetworkTTPF managed entity may exist for each instance of a vcNetworkCTPF managed entity. A vcTrailF is terminated by two vcNetworkTTPF. There is one instance of this managed entity for each vcTTPF managed entity.

7.60 vcSubnetworkConnectionF

This managed entity is a type of subnetworkConnectionF and inherits all the attributes and relationships defined by subnetworkConnectionF.

Attributes

ComponentPtrList: This pointer attribute identifies the vcSubnetworkConnectionF(s) and vcLinkConnectionF(s) that comprise this vcSubnetworkConnectionF. It may be the null pointer.

CompositePtr: This pointer attribute identifies the vcSubnetworkConnectionF managed entity to which this managed entity belongs. It may be the null pointer.

7.61 vcSubnetworkF

This managed entity is a type of subnetworkF and inherits all the attributes and relationships defined by subnetworkF. Signal identification is set to "VC".

Attributes

OLTPtr: This attribute identifies the associated OLT.

ContainedLinkList: This attribute identifies the instances of vcTopologicalLinkF contained in this subnetwork.

ContainedSubnetworkList: This attribute identifies the instances of vcSubnetworkF contained in this subnetworkF.

ContainedAccessGroupList: This attribute identifies the instances of accessGroupF contained in this subnetworkF.

LinkPtrList: This attribute identifies the instances of vcTopologicalLinkF terminated by this subnetwork.

7.62 vcTopologicalLinkEndF

This managed entity is a type of topologicalLinkEndF and inherits all the attributes and relationships defined by topologicalLinkEndF. This managed entity is used to represent the termination of a topological Link at the VC-layer. In the vcLayerNetworkDomainF, a vcTopologicalLinkEndF represents an ATM interface associated with the underlying transport facility. The PointDirectionality attribute will be "unidirectional".

Attributes

LinkTPTType: Describes the interface type that the managed entity supports: UNI, inter-NNI, intra-NNI, or unconfigured.

LoopbackLocationIdentifier: A code used for OAM cell loopback purposes. Incoming OAM Loopback cells with a Loopback Location field value that matches the value of the loopbackLocationIdentifier attribute shall be looped-back over the interface.

SupportedByPlug-inF: This attribute identifies the interface circuit pack to which this managed entity is associated.

PortId: This attribute indicates port Id on the plug-in associated with the vcTopologicalLinkEndF.

CellScramblingEnable: This attribute allows cell scrambling to be activated or deactivated on the ATM Interface represented by the vcTopologicalLinkEndF.

Relationships

Each vcTopologicalLinkF may be terminated by two instances of the vcTopologicalLinkEndF managed entity. One vcTopologicalLinkEndF managed entity is associated with one or more vcSubnetworkFs. Each vcTopologicalLinkEndF may be supported by one instance of a server vpNetworkTTPF managed entity in the server layer. vcNetworkCTPFs are contained in vcTopologicalLinkEndF.

7.63 vcTopologicalLinkF

This managed entity is a type of topologicalLinkF and inherits all the attributes and relationships defined by topologicalLinkF. Signal identification is set to "VC".

Attributes

RestorationMode: This attribute is used to configure the restoration mode of a link as: "unavailable for routing and re-routing", "available for routing and not re-routing"; "available for re-routing and not routing"; or "available for both routing and re-routing".

7.64 vcTrailF

This managed entity is a type of trailF and inherits all the attributes and relationships defined by trailF. This managed entity represents an I.326-defined trail in the VC layer domain. The vcTrailF is always bidirectional.

Attributes

RestoreableInd: This attribute is used to identify the connection as restoreable or not.

Relationships

Each vcTrailF is terminated by at least two vcNetworkTTPFs.

7.65 vdslLayerNetworkDomainF

This managed entity is a type of layerNetworkDomainF and inherits all the attributes and relationships defined by layerNetworkDomainF. ITU-T G.993.1 defines the characteristic signal associated with this layer.

7.66 vdslLinkConnectionF

This managed entity is a type of linkConnectionF and inherits all the attributes and relationships defined by linkConnectionF. This managed entity represents a VDSL link connection, derived from the ITU-T G.852.2 [5] definition, i.e., "the transparent capacity of transfer of information characterized by a given signal identification between two fixed points". Directionality is always set to "bidirectional".

Attributes

SignalIdentification: This fixed attribute describes the signal that is transferred across the link. Here, it is set to "VDSL".

Relationships

A topological link is a group of link connections sharing the same extremities. This relationship involves zero or more instances of the managed entity vdslLinkConnectionF. A vdslLinkConnectionF links two vdslNetworkCTPFs.

7.67 vdslNetworkCTPF

This managed entity is a type of networkCTPF and inherits all the attributes and relationships defined by networkCTPF. This managed entities is used to represent the termination of vdslTrailF.

Attributes

NEAssignmentPtr: This attribute serves as a pointer to the instance of the vdslCTPF managed entity to which it is related.

Relationships

One or more of these managed entities exist for each PhysicalPathTPF of type "VDSL". There is one of these managed entities for each vdslNetworkTTP. There is one or more of these managed entities contained within an ONU or NT.

7.68 vdslNetworkTTPF

This managed entity is a type of networkTTPF and inherits all the attributes and relationships defined by networkTTPF. This managed entity represents the point in the FSAN NE where vdslTrailF is terminated and originated. The following alarms can be detected at this managed entity: LOF (Loss of Frame), RFI (Remote Failure Indication), SD (Signal Degraded) fast datastream, SD (Signal Degraded) interleave datastream, SD (Signal Degraded) fast datastream far end, SD (Signal Degraded) interleave datastream far end, Initialization failed (detected by dataInitFailure, configInitFailure, protocolInitFailure, noPeerAtuPresent), Loss of Link, and Loss of Power.

Attributes

AlarmSeverityAssignmentProfilePtr: This attribute provides a pointer relationship to an alarm severity assignment profile managed entity.

AlarmStatus: This attribute provides information to the managing system on the alarm condition of the managed entity. Valid values include "under repair", "critical", "major", "minor", "alarm outstanding", and "null". Interpretation of these values is found in ITU-T X.731.

NEAssignmentPtr: This attribute serves as a pointer to the instance of the vdslTTPF managed entity to which it is related.

Relationships

There is one or more of these managed entities contained within an ONU or NT. One of these managed entities exists for each vdslNetworkCTP.

7.69 vdslSubnetworkF

This managed entity is a type of subnetworkF and inherits all the attributes and relationships defined by subnetworkF. Signal identification is set to "VDSL".

Attributes

ONUPtr: This attribute identifies the associated ONU.

ContainedLinkList: This attribute identifies the instances of vdslTopologicalLinkF contained in this subnetwork.

7.70 vdslTopologicalLinkEndF

This managed entity is a type of topologicalLinkEndF and inherits all the attributes and relationships defined by topologicalLinkEndF. Signal identification is set to "VDSL".

7.71 vdslTopologicalLinkF

This managed entity is a type of topologicalLinkF and inherits all the attributes and relationships defined by topologicalLinkF. Signal identification is set to "VDSL".

7.72 vdslTrailF

This managed entity is a type of trailF and inherits all the attributes and relationships defined by trailF.

Relationships

Each vdslTrailF is terminated by vdslNetworkTTPFs.

7.73 **voiceLayerNetworkDomainF**

This managed entity is a type of LayerNetworkDomainF and inherits all the attributes and relationships defined by LayerNetworkDomainF. Characteristic information provided in this layer is set to "Voice".

7.74 **voiceNetworkCTPF**

This managed entity is a type of NetworkCTPF and inherits all the attributes and relationships defined by NetworkCTPF. The attribute PointDirectionality has the value "bidirectional".

Attributes

TelephoneNumber: This attribute provides the network-owner-supplied value for the end-user telephone number.

SSCSParameterProfile2Ptr: This attribute identifies the SSCS parameter values used to provision this voice connection if AAL2 is employed.

NEAssignmentPtr: This attribute serves as a pointer to the instance of the voiceCTPF managed entity to which it is related.

Relationships

Zero or one instance of the voiceNetworkCTPF managed entity may exist for each instance of a voiceNetworkTTPF managed entity. One or more of these instances is associated with a voice channel.

7.75 **voiceNetworkTTPF**

This managed entity is a type of NetworkTTPF and inherits all the attributes and relationships defined by NetworkCTPF. The attribute PointDirectionality has the value "bidirectional".

Attributes

TelephoneNumber: This attribute provides the network-owner-supplied value for the end-user telephone number.

InterworkingVCCTPPtr: This attribute identifies the interworking VCC carrying this voice channel.

ChannelId: This attribute identifies the logical Channel Id for this service if AAL2 is employed. This attribute is null if another type of adaptation is employed.

NEAssignmentPtr: This attribute serves as a pointer to the instance of the voiceTTPF managed entity to which it is related.

Relationships

Zero or one instance of the voiceNetworkTTPF managed entity may exist for each instance of a voiceNetworkCTPF managed entity. One or more of these instances is associated with a voice channel on an ONT.

7.76 **voiceSubnetworkConnectionF**

This managed entity is a type of SubnetworkConnectionF and inherits all the attributes and relationships defined by SubnetworkConnectionF. If the FSAN system has a non-integrated voice gateway, then this managed entity is never instantiated. Characteristic information provided in this layer is set to "Voice". A voiceSubnetworkConnectionF is terminated by two voiceNetworkCTPFs.

7.77 voiceSubnetworkF

This managed entity is a type of subnetworkF and inherits all the attributes and relationships defined by subnetworkF. If a system has a non-integrated voice gateway, then this managed entity cannot be further decomposed. Characteristic information provided in this layer is set to "Voice".

7.78 vpLayerNetworkDomainF

This managed entity is a type of layerNetworkDomainF and inherits all the attributes and relationships defined by layerNetworkDomainF. Characteristic information provided in this layer is set to "VP".

7.79 vpLinkConnectionF

This managed entity is a type of linkConnectionF and inherits all the attributes and relationships defined by linkConnectionF. This managed entity represents an I.326 link connection, derived from the ITU-T G.852.2 [5] definition, i.e., "the transparent capacity of transfer of information characterized by a given signal identification between two fixed points." Directionality is always set to "bidirectional".

Attributes

SignalIdentification: This fixed attribute describes the signal that is transferred across the link. Here, it is set to "VP".

RetainedResource: This Boolean attribute indicates if the managed entity instance needs to be retained when it is a component of a composite connection (involving a set of link connections and subnetwork connections) that has been deleted or when supporting a trail that has been deleted.

CompositePtr: This pointer attribute identifies the vcSubnetworkConnectionF managed entity to which this managed entity belongs. It may be the null pointer.

Relationships

A topological link is a group of link connections sharing the same extremities. This relationship involves zero or more instances of the vpLinkConnectionF managed entity. A vpLinkConnectionF link is established between two vpNetworkCTPFs.

7.80 vpLogicalLinkF

This managed entity is a type of logicalLinkF and inherits all the attributes and relationships defined by logicalLinkF. Signal identification is set to "VP".

Attributes

LinkConnectionPtrList: This attribute identifies the vpLinkConnectionF instances grouped by this vpLogicalLinkF.

7.81 vpNetworkCTPF

This managed entity is a type of networkCTPF and inherits all the attributes and relationships defined by networkCTPF. This managed element is used to represent the termination of vpLinkConnectionF on an FSAN NE and (possibly) vpSubnetworkConnections. A Traffic descriptor profile is used to characterize this managed entity.

Attributes

VPIValue: This attribute identifies the VPI/VCI value associated with the link connection if the vcNetworkCTPF terminates a link connection.

SegmentEndPoint: This Boolean attribute indicates whether or not the vpNetworkCTPF managed entity instance has been configured to represent a VPC Segment End Point.

PMOAMMethod: This attribute indicates the method used to set up and terminate the PM OAM monitoring activity. Valid values are "TMN", "OAM", or "notSupported". If the value is "notSupported", then PM OAM is not supported on the end point.

PMOAMDirection: This attribute indicates the desired direction(s) of transmission to monitor PM OAM. Valid directions are: away from activator (transmit), towards activator (receive), or both.

PMOAMBlockSize: This attribute indicates the PM OAM nominal block size choice for both the receive and transmit directions.

PMOAMForwardActive: This Boolean attribute is used to initiate generation of PM OAM cells in the forward direction by setting the value to TRUE.

PMOAMBackwardActive: This Boolean attribute is used to initiate generation of PM OAM cells in the backward direction by setting the value to TRUE.

NEAssignmentPtr: This attribute serves as a pointer to the instance of the vpCTPF managed entity to which it is related.

Relationships

Zero or one instance of the vpNetworkCTPF managed entity may exist for each instance of a vpNetworkTTPF managed entity. Each instance of this managed entity may be associated with zero or one instance of the vpCTPF entity by the NE assignment Pointer attribute. Two of these management entities are associated with every vpLinkConnectionF. Zero or more of these managed entities may be associated with a vpSubnetworkConnectionF.

7.82 vpNetworkTTPF

This managed entity is a type of networkTTPF and inherits all the attributes and relationships defined by networkTTPF. This managed entity represents the point in the ATM subnetwork where the vpTrailF and associated overhead (F4 OAM cells) are terminated/originated.

Attributes

PMOAMMethod: This attribute indicates the method used to setup and terminate the PM OAM monitoring activity. Valid values are "TMN", "OAM", or "notSupported". If the value is "notSupported", then PM OAM is not supported on the end point.

PMOAMDirection: This attribute indicates the desired direction(s) of transmission to monitor PM OAM. Valid directions are: away from activator (transmit), towards activator (receive), or both.

PMOAMBlockSize: This attribute indicates the PM OAM nominal block size choice for both the receive and transmit directions.

PMOAMForwardActive: This Boolean attribute is used to initiate generation of PM OAM cells in the forward direction by setting the value to TRUE.

PMOAMBackwardActive: This Boolean attribute is used to initiate generation of PM OAM cells in the backward direction by setting the value to TRUE.

NEAssignmentPtr: This attribute serves as a pointer to the instance of the vpTTPF managed entity to which it is related.

Relationships

Zero or one instance of the vpNetworkTTPF managed entity may exist for each instance of a vpNetworkCTPF managed entity. A vcTrailF is terminated by two vpNetworkTTPF. There is one instance of this managed entity for each vpTTPF managed entity.

7.83 vpSubnetworkConnectionF

This managed entity is a type of subnetworkConnectionF and inherits all the attributes and relationships defined by subnetworkConnectionF.

Attributes

ComponentPtrList: This pointer attribute identifies the vpSubnetworkConnectionF(s) and vpLinkConnectionF(s) that comprise this vpSubnetworkConnectionF. It may be the null pointer.

CompositePtr: This pointer attribute identifies the vpSubnetworkConnectionF managed entity to which this managed entity belongs. It may be the null pointer.

7.84 vpSubnetworkF

This managed entity is a type of subnetworkF and inherits all the attributes and relationships defined by subnetworkF. Signal identification is set to "VP".

Attributes

OLTPtr: This attribute identifies the associated OLT.

ContainedLinkList: This attribute identifies the instances of vpTopologicalLinkF contained in this subnetworkF.

ContainedSubnetworkList: This attribute identifies the instances of vpSubnetworkF contained in this subnetworkF.

LinkPtrList: This attribute identifies the instances of vpTopologicalLinkF terminated by this subnetworkF.

7.85 vpTopologicalLinkEndF

This managed entity is a type of topologicalLinkEndF and inherits all the attributes and relationships defined by topologicalLinkEndF. This managed entity is used to represent the termination of a topological link at the VP-layer. In the vpLayerNetworkDomainF, a vpTopologicalLinkEndF represents an ATM interface associated with the underlying transport facility. The PointDirectionality attribute will be either "sink" or "source".

Attributes

LinkTPTType: Describes the interface type that the managed entity supports: UNI, inter-NNI, intra-NNI, or unconfigured.

LoopbackLocationIdentifier: A code used for OAM cell loopback purposes. Incoming OAM Loopback cells with a Loopback Location field value that matches the value of the loopbackLocationIdentifier attribute shall be looped-back over the interface.

SupportedByPlug-inF: This attribute identifies the interface circuit pack to which this managed entity is associated.

PortId: This attribute indicates port Id on the plug-in associated with the vpTopologicalLinkEndF.

CellScramblingEnable: This attribute allows cell scrambling to be activated or deactivated on the ATM Interface represented by the vcTopologicalLinkEndF.

Relationships

Each vpTopologicalLinkF may be terminated by two instances of the vpTopologicalLinkEndF managed entity. One vpTopologicalLinkEndF managed entity is associated with one or more vpSubnetworkFs. Each vpTopologicalLinkEndF may be supported by one instance of a server

APONNetworkTTP managed entity in the server layer. VpNetworkCTPFs are contained in vpTopologicalLinkEndF.

7.86 vpTopologicalLinkF

This managed entity is a type of topologicalLinkF and inherits all the attributes and relationships defined by topologicalLinkF. Signal identification is set to "VP".

Attributes

RestorationMode: This attribute is used to configure the restoration mode of a link as: unavailable for routing and re-routing, available for routing and not re-routing; available for re-routing and not routing; or available for both routing and rerouting.

7.87 vpTrailF

This managed entity is a type of trailF and inherits all the attributes and relationships defined by trailF. This managed entity represents an I.326- defined trail in the VP layer domain. The vpTrailF is always bidirectional.

Attributes

RestoreableInd: This attribute is used to identify the connection as restoreable or not.

ClientLinkList: This attribute is used to identify the vpLinkConnectionFs supported by the vpTrailF.

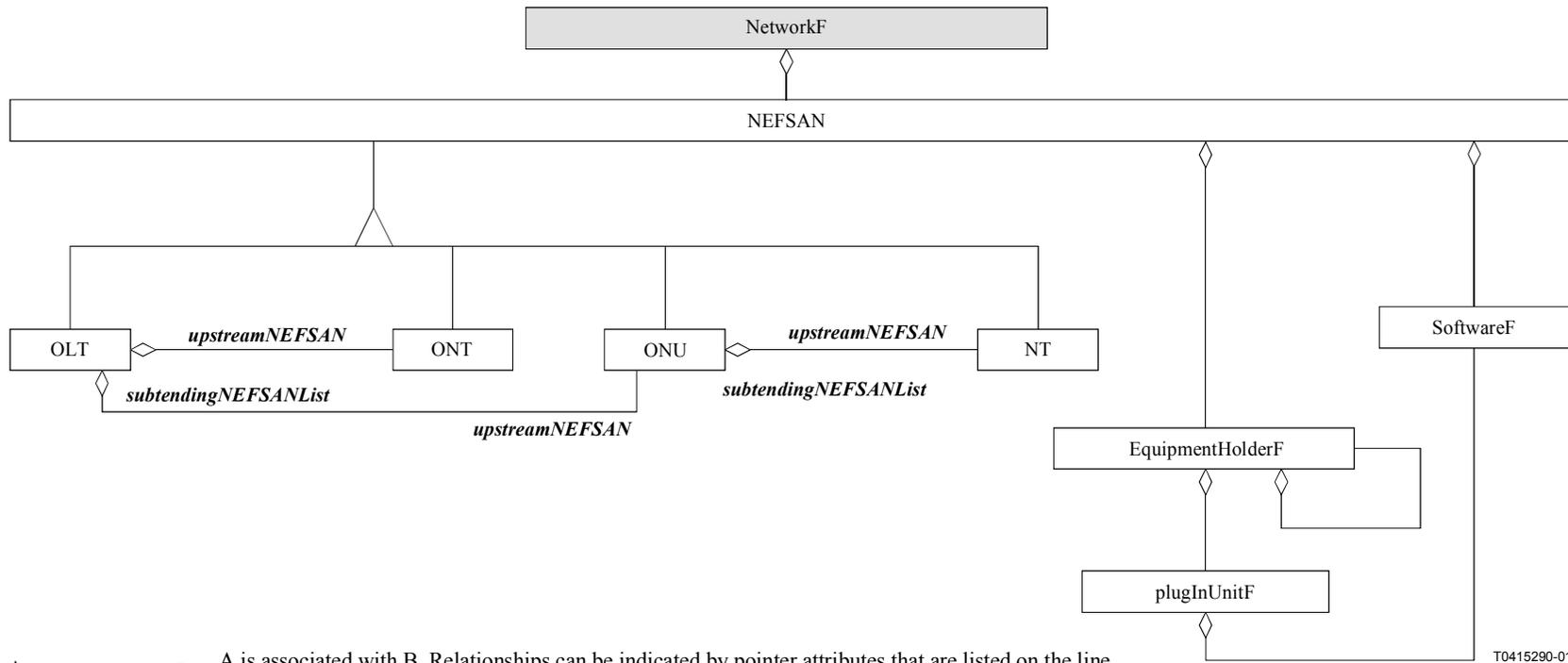
Relationships

Each vpTrailF is terminated by at least two vpNetworkTTPFs.

Entity relationship diagram

Notation defined in Figure A.1 applies to Figures A.1 to A.8.

A.1 Inventory management



- A — B A is associated with B. Relationships can be indicated by pointer attributes that are listed on the line.
- A —◇ B A is contained by B
- A —△ B B inherits from A

Figure A.1/Q.834.2 – E-R diagram for inventory management

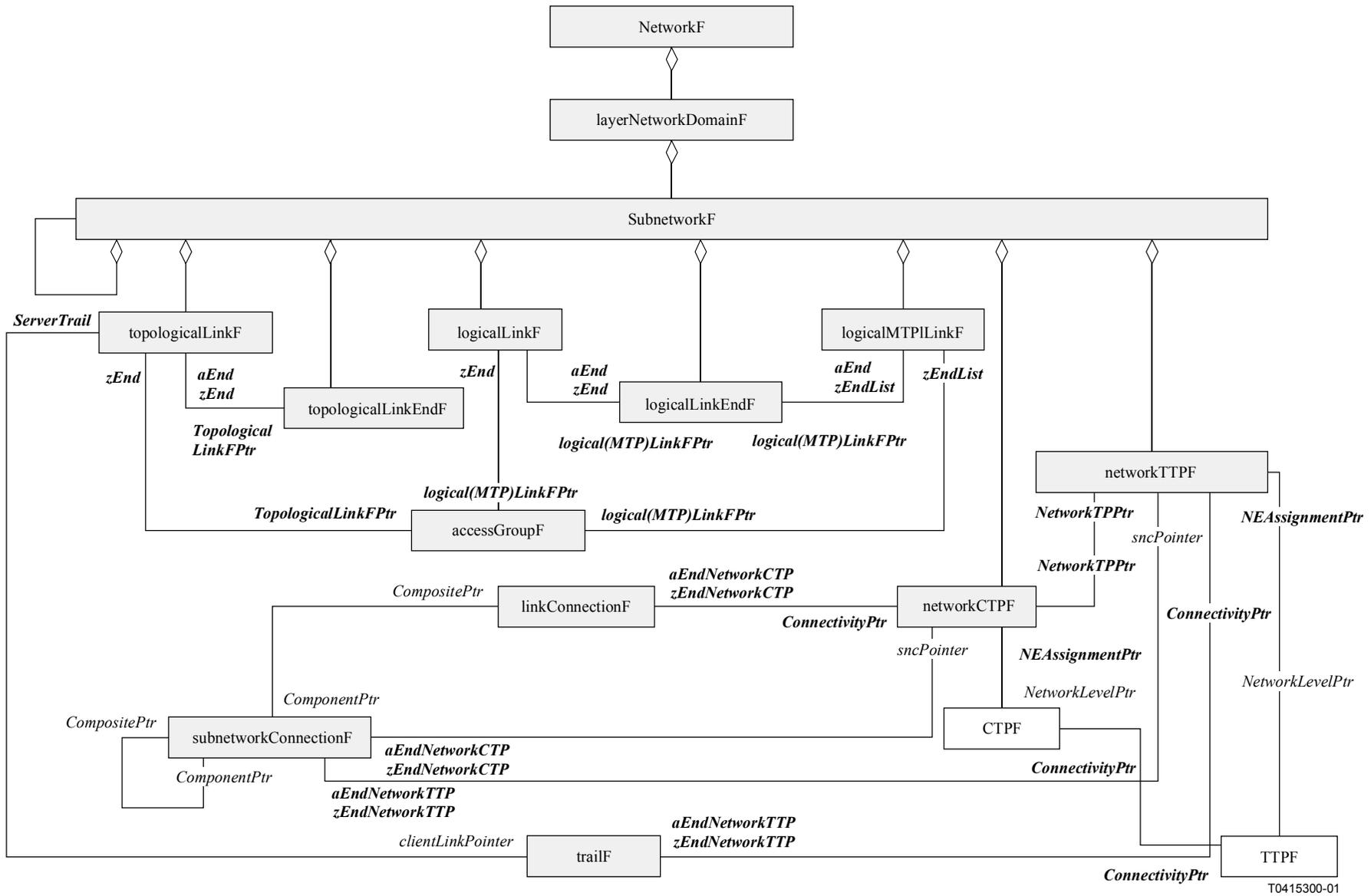
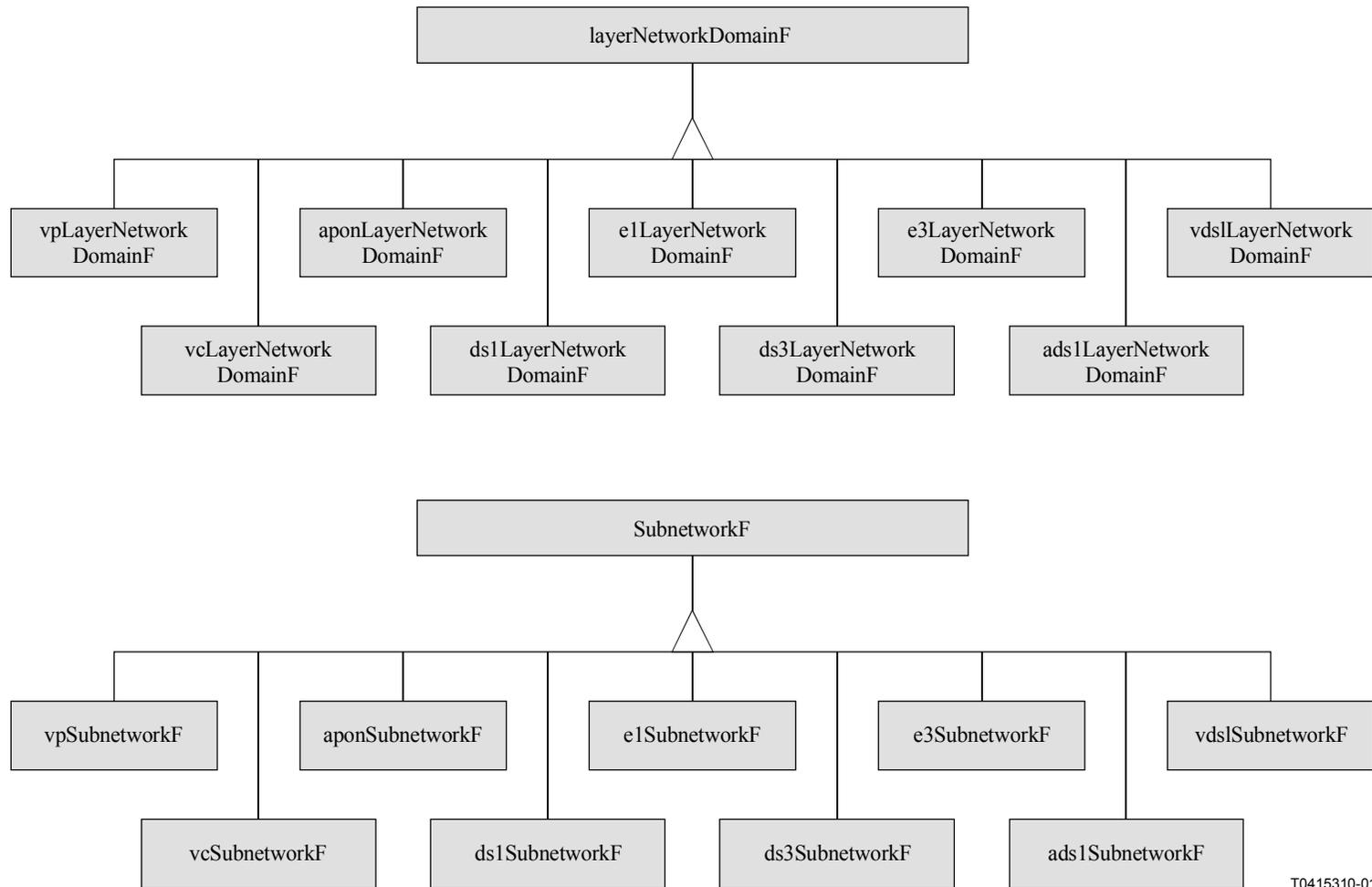


Figure A.2/Q.834.2 – E-R Diagram for network and capacity management

T0415300-01



T0415310-01

Figure A.3/Q.834.2 – E-R diagrams for layer network domain and subnetwork

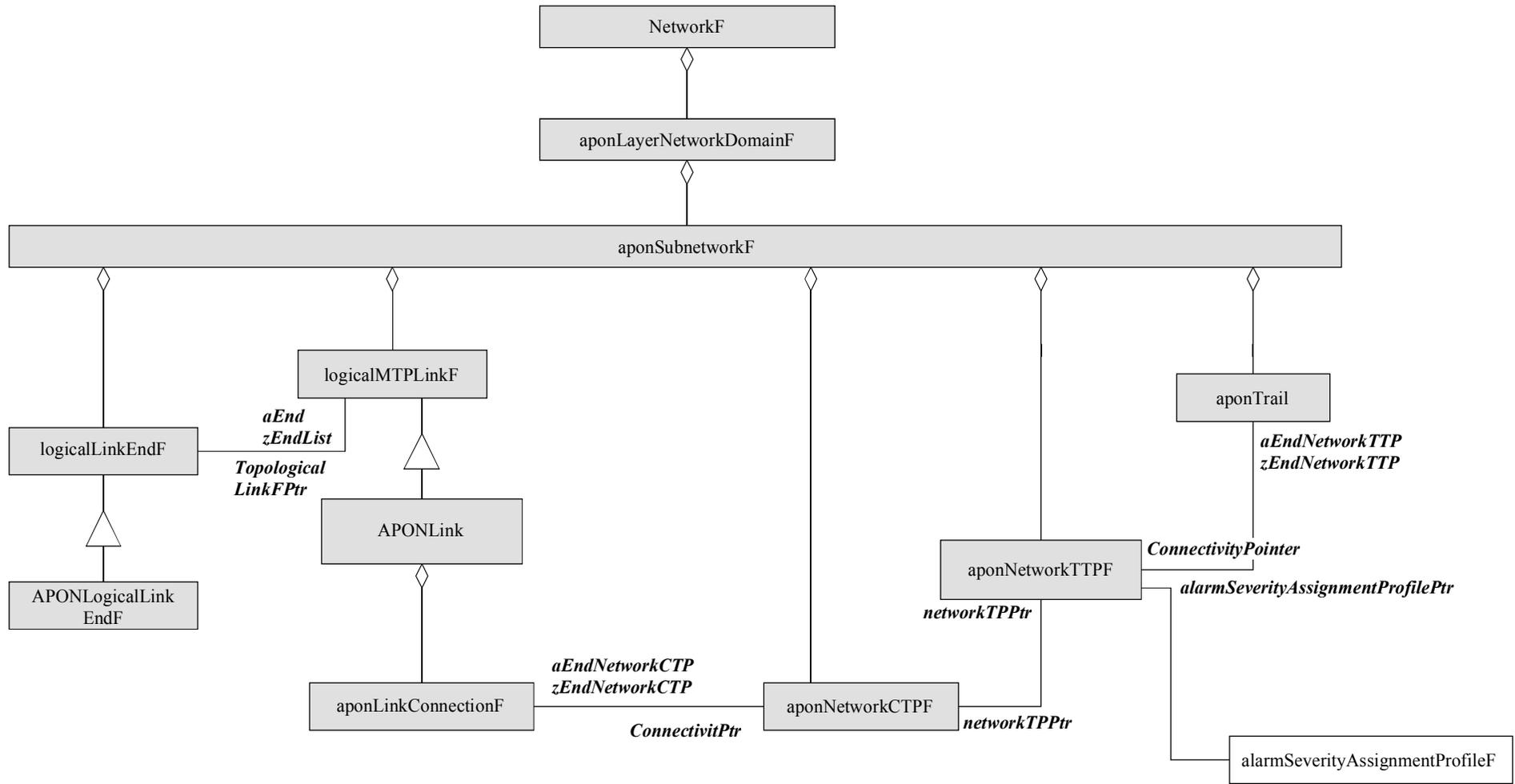
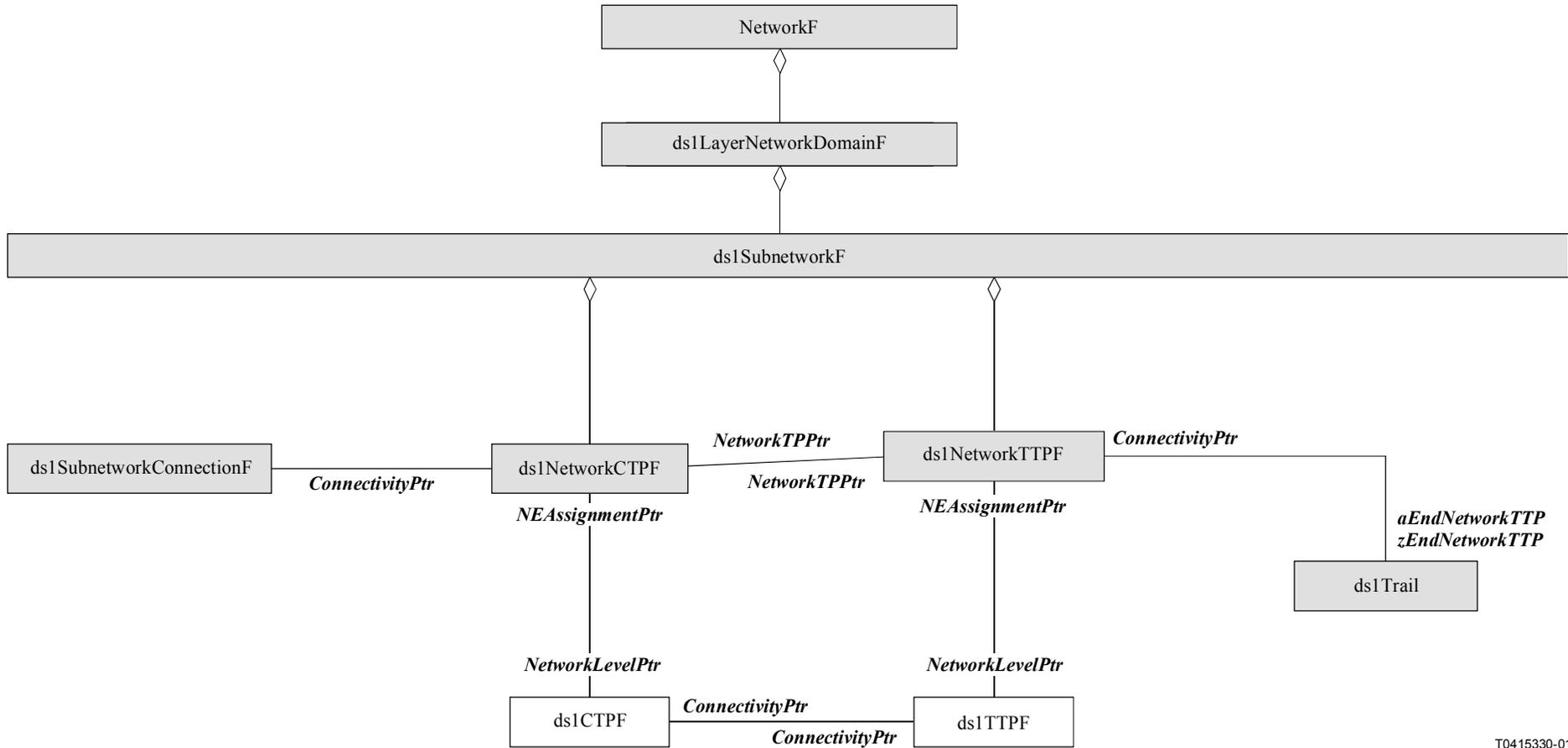


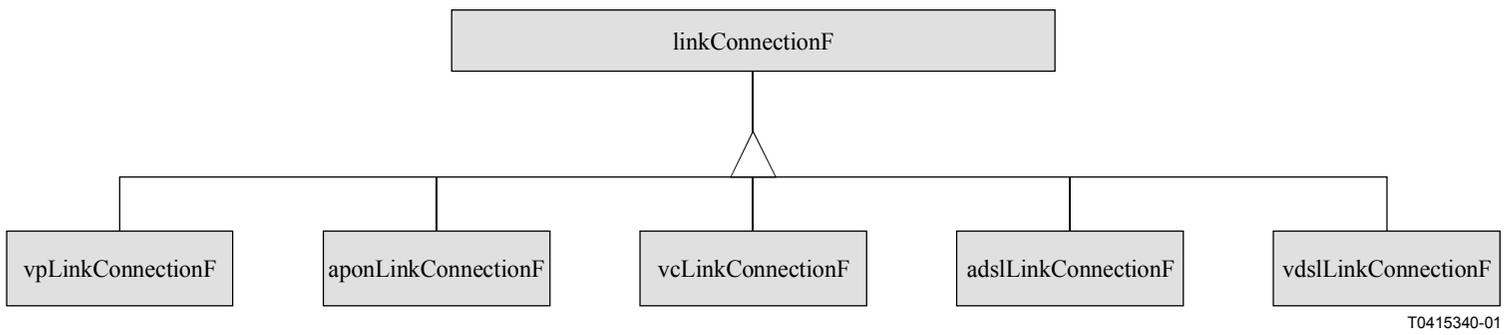
Figure A.4/Q.834.2 – Layer E-R diagram for APON layer

T0415320-01



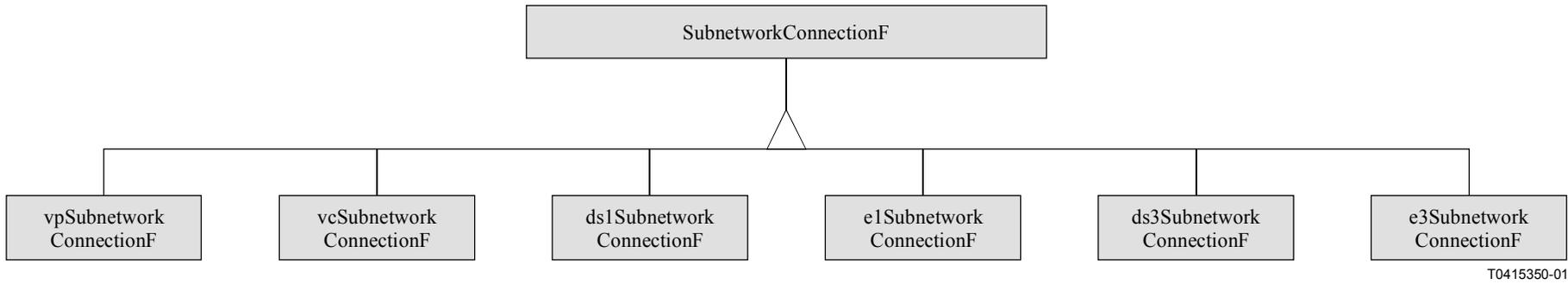
T0415330-01

Figure A.5/Q.834.2 – E-R diagram for DS-1 layer



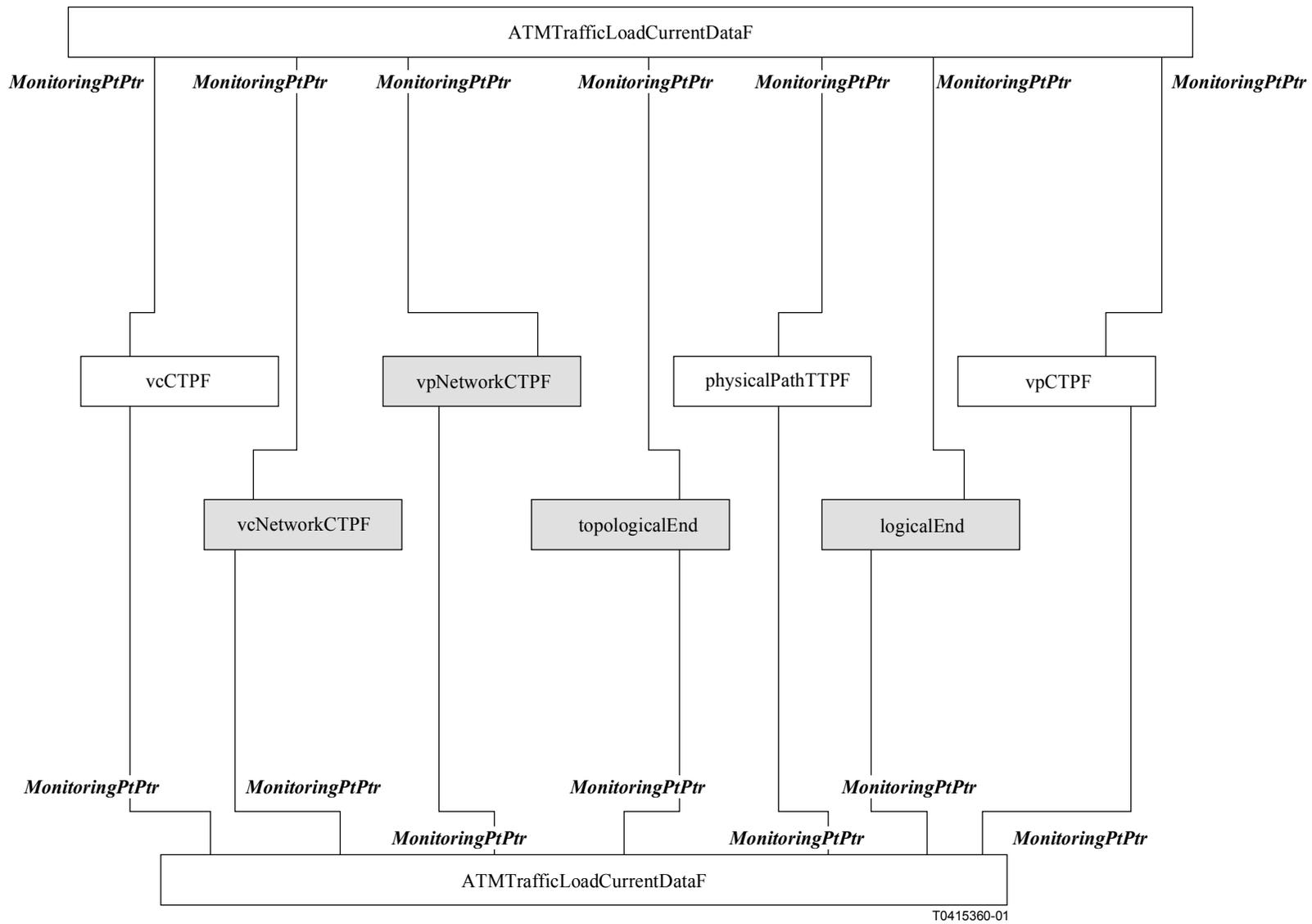
T0415340-01

Figure A.6/Q.834.2 – E-R diagram for link connection



T0415350-01

Figure A.7/Q.834.2 – E-R diagram for subnetwork connection



T0415360-01

Figure A.8/Q.834.2 – E-R diagram for ATM traffic load

APPENDIX I

Tables of managed entities

I.1 ITU-T Q.834.2

Table I.1/Q.834.2 – Usage of managed entities name (NW view)

Managed entity name in this Recommendation	Related managed object in other ITU-T Recommendations	Ref.
accessGroupF	AccessGroup (M3100amd)	
adslLayerNetworkDomainF		new
adslLinkConnectionF		new
adslNetworkCTPF		new
adslSubnetworkF		new
adslTopologicalLinkEndF		new
adslTopologicalLinkF		new
APONLayerNetworkDomain		new
APONLink		new
APONLinkConnection		new
APONNetworkCTP		new
APONNetworkTTP		new
APONSubNetwork		new
APONTrail		new
BridgedLANLayerNetworkDomainF		new
BridgedLANNetworkCTPF		new
BridgedLANNetworkTTPF		new
BridgedLANSubnetworkF		new
DS1LayerNetworkDomainF		new
DS1NetworkCTPF		new
DS1NetworkTTPF		new
DS1SubnetworkConnectionF		new
DS1SubnetworkF		new
DS3LayerNetworkDomainF		new
DS3NetworkCTPF		new
DS3NetworkTTPF		new
DS3SubnetworkConnectionF		new
DS3SubnetworkF		new
E1LayerNetworkDomainF		new
E1NetworkCTPF		new
E1NetworkTTPF		new
E1SubnetworkConnectionF		new
E1SubnetworkF		new
E3LayerNetworkDomainF		new

Table I.1/Q.834.2 – Usage of managed entities name (NW view) (continued)

Managed entity name in this Recommendation	Related managed object in other ITU-T Recommendations	Ref.
E3NetworkCTPF		new
E3NetworkTTPF		new
E3SubnetworkConnectionF		new
E3SubnetworkF		new
layerNetworkDomainF	LayerNetworkDomain (M3100amd)	AF58
linkConnectionF	LinkConnection (M3100amd)	AF58
logicalLinkEndF	LogicalLinkEnd (M3100amd)	
logicalLinkF	LogicalLink (M3100amd)	
logicalMTPLinkF		new
networkCTPF	NetworkCTP (M3100amd)	
networkF	networkR1 (M.3100)	AF58
networkTTPF	NetworkTTP (M3100amd)	
subnetworkConnectionF	SubnetworkConnection (M3100amd)	AF58
subnetworkF	Subnetwork (M3100amd)	AF58
topologicalLinkEndF	TopologicalLinkEnd (M.3100amd)	AF58
topologicalLinkF	TopologicalLink (M.3100amd)	AF58
trailF	TrailR2 (M.3100amd)	AF58
vcLayerNetworkDomainF	LayerNetworkDomain (M.3100amd)	AF58
vcLinkConnectionF	LinkConnection (M.3100amd)	AF58
vcLogicalLinkF	LogicalLink (M3100amd)	
vcNetworkCTPF	vcNetworkCTP (M3100amd)	
vcNetworkTTPF	vcNetworkTTP (M3100amd)	
vcSubnetworkConnectionF	SubnetworkConnection (M.3100amd)	AF58
vcSubnetworkF	Subnetwork (M.3100amd)	AF58
vcTopologicalLinkEndF	TopologicalLinkEnd (M.3100amd)	AF58
vcTopologicalLinkF	TopologicalLink (M.3100amd)	AF58
vcTrailF	TrailR2 (M.3100amd)	AF58
vdsILayerNetworkDomainF		new
vdsILinkConnectionF		new
vdsINetworkCTPF		new
vdsISubnetworkF		new
vdsITopologicalLinkEndF		new
vdsITopologicalLinkF		new
voiceLayerNetworkDomainF		new
voiceNetworkCTPF		new
voiceNetworkTTPF		new
voiceSubnetworkConnectionF		new
voiceSubnetworkF		new
vpLayerNetworkDomainF	LayerNetworkDomain (M.3100amd)	AF58

Table I.1/Q.834.2 – Usage of managed entities name (NW view) (concluded)

Managed entity name in this Recommendation	Related managed object in other ITU-T Recommendations	Ref.
vpLinkConnectionF	LinkConnection (M.3100amd)	AF58
vpLogicalLinkF	LogicalLink (M3100amd)	
vpNetworkCTPF	vpNetworkCTP (M3100amd)	
vpNetworkTTPF	vpNetworkTTP (M3100amd)	
vpSubnetworkConnectionF	SubnetworkConnection (M.3100amd)	AF58
vpSubnetworkF	Subnetwork (M.3100amd)	AF58
vpTopologicalLinkEndF	TopologicalLinkEnd (M.3100amd)	AF58
vpTopologicalLinkF	TopologicalLink (M.3100amd)	AF58
vpTrailF	TrailR2 (M.3100amd)	AF58
Ref. References other than ITU-T Recommendations: AF-NM-0058.001		
new Newly defined		
amd amendment		

I.2 ITU-T Q.834.1

Table I.2/Q.834.2 – Usage of managed entities name

Managed entity name in ITU-T Q.834.1 [4]	Related managed object in other ITU-T Recommendations	Ref.
AAL1PMCurrentDataF	AALProtocolCurrentData (Q.824.6)	AF20
AAL1PMHistoryDataF	AALProtocolHistoryData (Q.824.6)	AF20
AAL1ProfileF	AALProfile (Q.824.6)	AF20
AAL2PMCurrentDataF		new
AAL2PMHistoryDataF		new
AAL2ProfileF		new
AAL2PVCProfileF		new
AAL5PMCurrentDataF	AALProtocolCurrentData (Q.824.6)	AF20
AAL5PMHistoryDataF	AALProtocolHistoryData (Q.824.6)	AF20
AAL5ProfileF	AALProfile (Q.824.6)	AF20
adslCTPF		new
adslTTPF		new
alarmLogRecordF	alarmRecord (X.721)	AF20
alarmSeverityAssignmentProfileF	alarmSeverityAssignmentProfile (M.3100)	AF20
APONCTP		new
APONStaticBW		new
APONPMCurrentData		new
APONPMHistoryData		new
APONTTP		new
ATMCrossConnectionControlF	atmFabric (I.751)	AF20
ATMCrossConnectionF	atmCrossConnection (I.751)	AF20

Table I.2/Q.834.2 – Usage of managed entities name (continued)

Managed entity name in ITU-T Q.834.1 [4]	Related managed object in other ITU-T Recommendations	Ref.
ATMNetworkAccessProfileF		new
ATMTrafficLoadCurrentDataF	atmTrafficLoadCurrentData (I.751)	AF20
ATMTrafficLoadHistoryDataF	atmTrafficLoadHistoryData (I.751)	AF20
attributeValueChangeRecordF	AttributeValueChangeRecord (X.721)	AF20
au3CTPF	au3CTP (G.774)	
au4CTPF	au4CTP (G.774)	
BICIF	InterNNI (I.751)	AF20
BISSIF	IntraNNI (I.751)	AF20
bridgedLANServiceProfileF		new
cellBasedCTPF		new
cellBasedTTPF		new
CESServiceProfileF		AF20
CTPF		new
DS1CTPF		new
DS1PMCurrentDataF		new
DS1PMHistoryDataF		new
DS1TTPF		new
DS3CTPF		new
DS3PMCurrentDataF		new
DS3PMHistoryDataF		new
DS3TTPF		new
E1CTPF		new
E1PMCurrentDataF		new
E1PMHistoryDataF		new
E1TTPF		new
E3CTPF		new
E3PMCurrentDataF		new
E3PMHistoryDataF		new
E3TTPF		new
equipmentHolderF	equipmentHolder (M.3100)	AF20
EthernetCTPF		new
EthernetPMCurrentDataF		new
EthernetPMHistoryDataF		new
EthernetProfileF		new
EthernetTTPF		new
filterProfileF		new
LESServiceProfileF		new
logF	log (X.721)	AF20
MACBridgeConfigurationDataF		new

Table I.2/Q.834.2 – Usage of managed entities name (continued)

Managed entity name in ITU-T Q.834.1 [4]	Related managed object in other ITU-T Recommendations	Ref.
MACBridgeF		new
MACBridgePMCurrentDataF		new
MACBridgePMHistoryDataF		new
MACBridgePortConfigurationDataF		new
MACBridgePortPMCurrentDataF		new
MACBridgePortPMHistoryDataF		new
MACBridgeServiceProfileF		new
managedEntityCreationLogRecordF	objectCreationRecord (X.721)	AF20
managedEntityDeletionLogRecordF	objectDeletionRecord (X.721)	AF20
MLTTestResultsF		new
msCTPF	msCTP (G.774)	
msTTPF	msTTP (G.774)	
NEFSAN		new
NT	equipmentR1 (M.3100)	
OLT	managedElementR1 (M.3100)	
ONT	managedElementR1 (M.3100)	
ONU	managedElementR1 (M.3100)	
PhysicalPathTPF		AF20
pluginUnitF	circuitPack (M.3100)	AF20
rsCTPF	rsCTP (G.774)	
rsTTPF	rsTTP (G.774)	
softwareF	softwareR1 (M.3100)	AF20
SSCSParameterProfile1F	SSCSParameterProfile1 (I.366.1)	
SSCSParameterProfile2F	SSCSParameterProfile2 (I.366.2)	
tcAdaptorF	tcAdaptorTTP (I.751)	AF20
thresholdDataF	thresholdData (Q.822)	AF20
trafficDescriptorProfileF		AF20
TTPF		new
uniF	uni (I.751)	AF20
uniInfoF		new
upcNpcDisagreementPMCurrentDataF	upcNpcCurrentData (I.751)	AF20
upcNpcDisagreementPMHistoryDataF	upcNpcHistoryData (I.751)	AF20
vc3TTPF	vc3TTP (G.774)	
vc4TTPF	vc4TTP (G.774)	
vcCTPF	vcCTP (I.751)	AF20
vcTTPF	vcTTP (I.751)	
vdslCTPF		new
vdslTTPF		new
VoiceCTPF		new

Table I.2/Q.834.2 – Usage of managed entities name (concluded)

Managed entity name in ITU-T Q.834.1 [4]	Related managed object in other ITU-T Recommendations	Ref.
VoicePMCurrentDataF		new
VoicePMHistoryDataF		new
VoiceServiceProfileAAL1F		new
VoiceServiceProfileAAL2F		new
VoiceTTPF		new
vpCTPF	vpCTP (I.751)	AF20
vpTTPF	vpTTP (I.751)	
vpvcPMCurrentDataF	vpvcPMCurrentData (I.751)	
vpvcPMHistoryDataF	vpvcPMHistoryData (I.751)	
Ref. References other than ITU-T Recommendations: AF-NM-0020.001		
new Newly defined		

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